

Gravel Pit SOP (Draft)

Sand, gravel and quarry operations are an essential part of Garrison and Training maintenance and development within USARAK. These materials are needed for road and building construction, training area upgrades and repair.....

Sand, gravel and stone deposits are generally available in finite and limited quantities. Consequently, it is important that they be managed wisely. Careful planning allows the pit operator to maximize the permissible extraction limits, while also conserving the upper soil layers and minimizing environmental impacts.

This manual is intended to help users of USARAK gravel pits understand the operational requirements, along with subsequent reclamation responsibilities.

Pits and quarries typically require land clearing, the removal of the topsoil, stripping of overburden and development of processing and loading facilities on one site.

This manual has two main sections. Section I covers the standards, and includes the laws and regulations affecting pits and quarries. Section 2 and 3 covers extraction coordination with the pit manager and the minimum development and reclamation requirements that must be met. Section 4 covers basic definitions.

There are three stages to the development and reclamation process. Stage I involves planning the pit or quarry operation and obtaining extraction approval. Early consultation will help determine site options and select the most suitable site. Stage II is the extraction stage when the operator must ensure, on a daily basis, that they are following the conditions of their permit or license. Following the operation guidelines simplifies the reclamation process at the end of the life of the pit or quarry. Stage III involves pit reclamation and closure. It should be straightforward since the end use was defined at the application stage and followed during pit or quarry operations. Thus, reclamation needs will have been anticipated and planned for.

Stage I: Planning

- Identify site options; initiate consultation; inspect and determine resource suitability of preferred site
- Design the operation plan and determine end land use
- Submit application for quarry permit or license
- Layout and stake active work areas with pit manager

Stage II: Operations

- Prepare pit/quarry for extraction
- Follow pit and quarry operating procedures shown on the plan and set out in permit or license
- Perform progressive reclamation and development where required
- Ensure site is secure when not in use.

Stage III: Reclamation

- Pit and quarry closure: temporary or permanent?
- Site clean-up, re-grade as required
- Drainage and erosion control; replace overburden and soil; re-vegetation
- Reclaim to productive end use. Monitor reclamation result.

Operational Standards

Operational standards cover issues commonly associated with industrial impacts. These standards are set up to eliminate or reduce the potential impacts of mining on the environment and surrounding land uses. Most of these impacts can be resolved by a combination of proper siting of operations and facilities or by technical solutions. Specifically, these operation standards cover such topics as:

1. Noise

Primary sources of noise are truck traffic, stone crushers, processing plants, and dumping of aggregates on metal such as trucks and loading hoppers. Communities set decibel levels for mining operations. Most noise levels standards can be met through a combination of proper equipment maintenance, using natural terrain to reduce the noise level or by creating earth berms in appropriate locations. Distance between the noise source and the recipient is an important factor in reducing noise impacts. Vegetation of any type has little value in noise reduction.

2. Dust

Primary sources of dust are from truck traffic within the mine site, processing plants, stockpiles of processed material, and from land areas stripped of vegetation. Methods for controlling dust in mine sites include water suppression, application of environmentally safe chemical solutions, proper design and maintenance of processing equipment, and minimization of the amount of land void of vegetation at any point in time. Dust is not as serious an issue in mine sites where washing operations are included in the processing plant.

3. Aesthetics

Primary issues are undesirable views of industrial structures and equipment, waste material and processed aggregates stockpiles, and disturbed land areas. Most negative visual aspects of a mine site can be resolved by using the natural terrain and woodlands in siting the processing plant and by using the natural terrain and woodlands in directing the pattern of excavation. In addition, negative views associated with disturbed land areas can be minimized by a sequential mining and reclamation program to keep the amount of disturbed land, at any given point in time, to a minimum. Proper design and maintenance of the processing plant, areas surrounding the plant, and entrances to the plant will reduce negative visual aspects of the processing plant. Other techniques include installation of earth berms and plant material screens, and placement of all operational areas and activities at the lowest point in a pit or quarry.

4. Surface Hydrology

For the most part off-site surface drainage is reduced because of the hole created by mining operations. However, erosion and sedimentation associated with disturbed land areas and with constructed earth berms may increase sediment load in runoff leaving the site. Standards dealing with alterations to natural drainage courses and wetlands are addressed in other federal, state and local statutes and are typically referenced in mining ordinances. An incidental benefit to ground water systems that can occur in mine sites is that a greater amount of surface water will flow into the ground water system.

5. Sub-surface Hydrology

The primary concern of mining activities on sub-surface hydrology is the potential impact on the ground water table. At issue is whether or not the water table will be contaminated by the mining operation or whether or not the water table will be lowered, thereby affecting the water table level on adjacent properties. This is a complex and many times controversial issue. There are several points to understand. First all mining does not extend into the ground water. If mining stays above the ground water, it is unlikely operations will affect the quality or quantity of the ground water. Second, if a quarry operation extends below the natural water table, the water level must be lowered to the level just below the quarry floor. This means water will be discharged off site. If the water table is proposed to be lowered, extensive hydrologic engineering tests and modeling will be required to assess how far beyond the mine site boundaries the water table will be lowered. Tests must also be conducted to assess the quality of discharged water. This process then leads into an extensive permitting procedure. It will also require a remediation program if the lowered water table has any negative impacts on adjacent properties. Third, sand and gravel can be extracted from the water table without lowering the water. This can be accomplished with either a dredge or a dragline. Public concern about contamination and lowering the water table also exist for these sand and gravel operations.

6. Traffic

Off-site trucking is one of the most contentious and controversial issues associated with mining operations. Issues of road type and condition, trucking routes, truck size, the number of trucks, and access from the mine site are commonplace. The involvement of traffic engineers in both the determination of trucking impacts and the design of entrances is critical.

7. Additional Standards

Other operation standards addressed should include, setback requirements that detail how close mining operations and facilities can be to property lines and to neighboring uses; hours of operations during the day and during the week; and fencing requirements to secure the site from accidental intrusion. These standards vary considerably from community to community. For example, setback requirements related to how close mining can come to property line may be twenty-five feet in one community and 500 feet in the neighboring community.

Reclamation Standards

1. Topsoil Removal and Replacement

Most ordinances require preservation of topsoil for use in reclaiming mined land. They typically prescribe stockpiling methods and minimum depth of replaced topsoil. Many ordinances also prohibit removal of topsoil from the site. This particular requirement may be challenged when lakes are created in the mined areas resulting in less area to be covered by topsoil.

2. Sub-soil Handling

Sometimes referred to as overburden, this material covers the deposit to varying depths and may include more than 20,000 cubic yards of earth material per acre. Ordinances are inconsistent in regulating the handling and application this material even though it is one of the primary materials used in reclaiming mined land. It is material that must be excavated to gain access to the mineral deposit. It is also a material that can be used to shape lands in a cost effective way.

3. Slopes

Minimum slope requirements for pit and quarries vary considerably. They range from 2h:1v to 15h:1v with the most common slope requirements being in the range of 3h:1v to 4h:1v. For quarry walls the slope requirements may be expressed as height of walls and width of benches or terraces. In addition, special slope requirements may be set for shorelines and below water areas. The stated reasons for establishing these “minimum” slopes are safety and land stability.

4. Re-vegetation

Most ordinances call for the establishment of “suitable ground cover with few other planting and landscaping requirements. Some require vegetation screens with no other specifics while others spell out density and size requirements and provide lists of acceptable species that can be used in “screen” plantings. Few require tests for disturbed soil conditions or require any type of land management program to assure establishment of vegetation on disturbed areas.

5. Mining in Relation to Water Table

Many local ordinances have little to say about the water table other than set some monitoring wells. Others set a variety of limits and requirements. These may include setting specific monitoring programs, minimum depths of undisturbed soil above the high water table, or minimum depths below water table. Some prohibit the creation of shallow water areas. This latter requirement presents some difficulties when the end use involves the creation of certain types of water-based habitats.

6. Bonding

Bonding requirements are established to assure reclamation activities are completed according to the approved plan. The purposes of the bond are to

provide money to re-grade and re-vegetate disturbed areas, stabilize steep banks and remove structures, equipments and debris from the site in the event the mining company defaulted on the reclamation agreement.

7. Ancillary Uses

A variety of ancillary uses commonly associated with aggregate mining operations may be allowed or prohibited, depending on the land use zone district within which the site is located. These typically include asphalt plants, concrete ready mix plants, and concrete and asphalt recycling operations. Some ordinances will not allow any of these uses in conjunction with mining operations. Other ordinances will require additional applications and hearings.

Questions to be raised:

- How much topsoil and overburden covers the deposit? What are the characteristics of this material? How is this material distributed throughout the site?
- What types of earth moving equipment will be used to strip overburden from the deposit? How far can this material be hauled? What are the costs of moving this material? Are there alternatives in handling and depositing this material? How much of an area is stripped of overburden at any one time? Will this material be stockpiled for future use or can it be deposited to form specific land forms according to a plan? What is the total volume of overburden that can be available for land shaping?
- What is the depth and extent of the deposit? What is the present and future exposure of this site to the surrounding lands?
- What are the characteristics of the deposit? Are there any significant quality changes in the deposit that could affect mining activity? Are there any areas within the deposit that will not be mined? What is the estimated percentage of fines that will be washed from the processed aggregates (this is based upon total volume of reserves)? Can any reserves be left in place for the benefit of land development? What parts of the deposit can be mine first? What parts of the mined deposit can be reclaimed first? What is the projected life of the mining operation?
- What is the estimated elevation of the ground water table? Before mining? After mining? What is the depth of deposit below and above this water table? Where are the deepest and shallowest water areas? If it is a quarry operation, what will be the impact on ground water elevations in the surrounding areas if the water table is lowered? What is the quality of this water?
- What type of excavating equipment will be used in the pit or quarry? What will be the visual and sound exposure of the excavating equipment? Can this equipment be used in shaping proposed land forms? What is the pattern and direction of excavation? Can this pattern and direction be modified to benefit mining and reclamation efforts? How much area will be disturbed each year? If developing a sequential or phased mining and reclamation program, how large an excavation area must remain un-

reclaimed at any given point in time? To what extent is it possible to integrate the stripping, excavating, and reclamation operations? If water areas are created, how will the shorelines be shaped? Can excavating be conducted in such a way as to minimize exposure of the pit or quarry to the surrounding lands? What techniques can be used to screen the pit or quarry?

- What is the size of the processing plant area? What is the physical relationship between the processing plant, the pit or quarry, and the entrance area? What are the area requirements for the sedimentation ponds? How will the accumulated sediments be handled? Can the processing plant be located within the pit or quarry or must it remain on the original grade? To what extent can the processing plant be sited to take advantage of terrain and wooded areas for purposes of visual and sound screening? What is the height of the tallest structure? Can the entrance to the site be designed to create a more attractive industrial setting?

Data Requirements

1. Surface Conditions

This information includes any data typically required for a site analysis, including topographic map specifications, natural, historical and archeological features, visual characteristics on and off site, and off-site conditions such as land use, access, and road systems.

2. Deposit Conditions

Often a minimum number of borings are required to determine general deposit characteristics and ground water information. Some ordinances request information of resource specifications and quantity. This latter data may become a testy issue due to the fact that this is often considered privileged information that could benefit competitors if it was made public.

3. Operations

Information required under this category includes descriptions of equipment to be used on-site, the processing plant and types of processes, water handling methods, excavation methods, production capacity and the number of trucks entering and leaving the site on an average day.

4. Other Data

- Modeling studies to determine impacts of the operation on ground water
- Traffic studies
- Decibel levels for each piece of equipment
- Proposed truck haul routes
- Soil tests
- Boundary survey

- Cross-sections of the deposit
- Woodlands inventory
- Isopach maps indicating thickness of deposits and depths to ground water

Primary Project Objectives

- Design and locate the processing plant so it is totally screened from public view throughout the mining operation.
- Select mining equipment and conduct an extraction pattern that will be hidden from public view throughout the mining operation.
- Minimize the impact of mining on adjacent lands throughout the mining operation.
- Design an earth moving and mining sequence
- Take full advantage of available earth materials and deposit characteristics to create developable land and water areas.
- Allow for maximum access to aggregate reserves.

Submission Requirements

1. Operation Plans

Required documents may include plans that show locations of entrance areas, scale houses, processing plants, stockpile areas, sediment ponds, and berms and planting screens. In addition, these plans may be required to illustrate and describe mining and reclamation sequence activity.

2. Grading Plans

These plans will illustrate the drainage and proposed configuration of the reclaimed site. Information about fill areas may or may not be required.

3. End Use Plan

This plan is required to illustrate concepts for end use development of the reclaimed site. Because of the long-term nature of mining, it may be imprudent to be very specific about the end use of a site that may not be available for development for twenty to fifty years. The best approach is to illustrate the usability of the reclaimed site for a number of potential uses.

4. Planting Plan

Few ordinances require a detailed planting plan. However, it is strongly suggested that a plan be prepared to illustrate areas to be screening, erosion control techniques and general landscape improvements for the reclaimed site.

Questions to be Raised

- Is the proposed mine site located in a land use zone district that will permit aggregate mining?
- What type of information is required to complete an application for a permit to extract aggregates?
- What is the relationship between state and local regulations pertaining to the mining of aggregates?

- What types of documents are needed to complete the application?
- Will any of the standards impede efforts to develop a creative reclamation program?
- Will there be a need to request variances to the standards in order to develop a better reclamation plan?
- What tests are needed to meet regulatory requirements?
- What are the bonding requirements?
- Can a concrete and asphalt recycling operation or any other ancillary uses be included?
- Are there any local or state policies related to the protection, use and development of aggregate resources?